New Resource Adequacy Criteria for the Energy Transition

ESIG Redefining Resource Adequacy Task Force

Derek Stenclik, ESIG Spring Workshop, March 2024

TELOS ENERGY

ESIG Redefining Resource Adequacy Task Force

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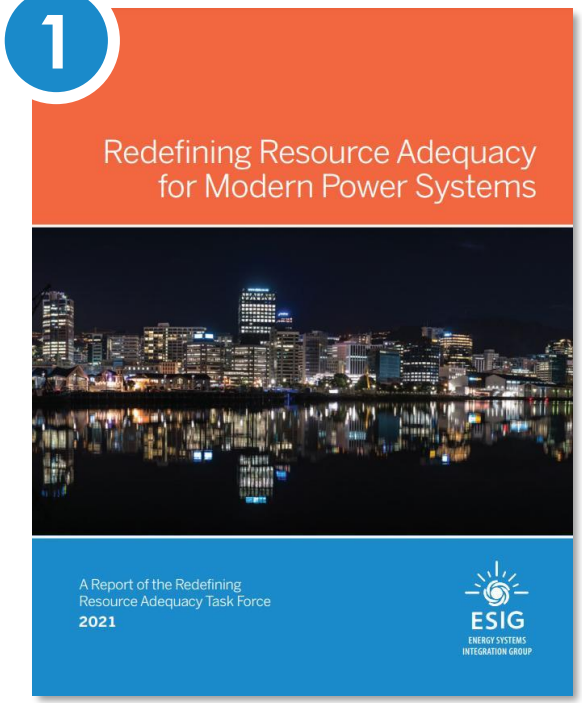
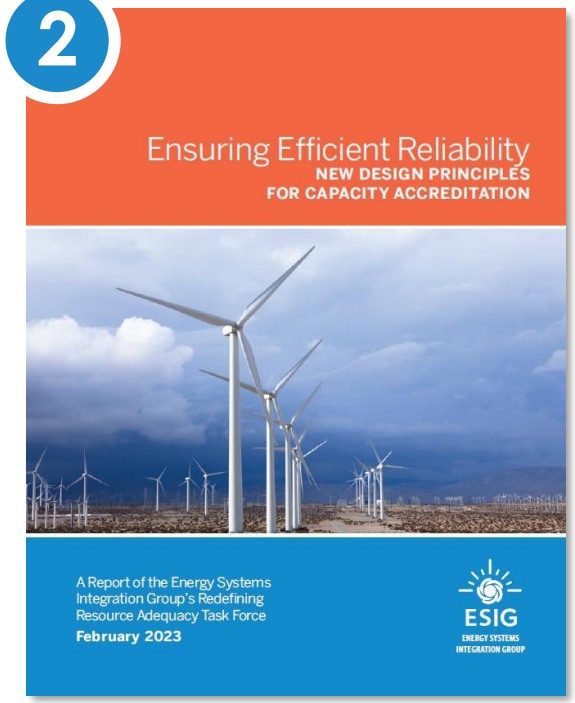


Probabilistic Analysis & First Principles

Chronology & Correlation

2

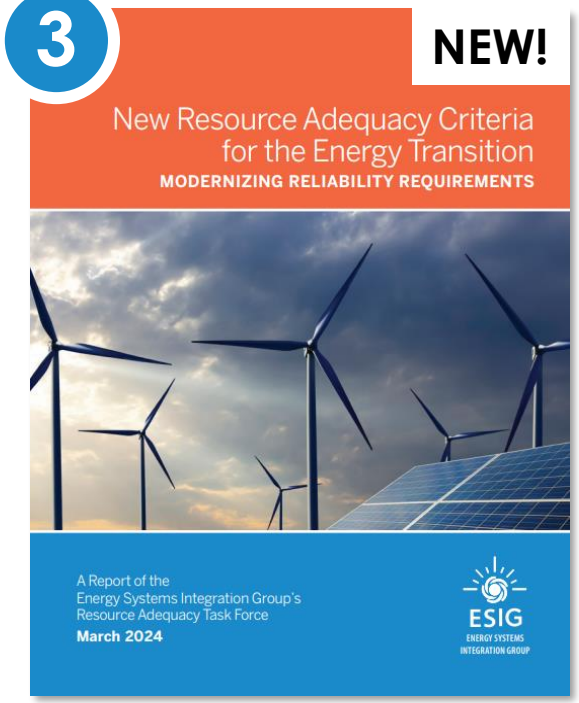


Capacity Accreditation and Procurement

Capacity accreditation for all resources

3

NEW!



New Reliability Criteria & Capacity Needs

Moving beyond 1-day-in-10 LOLE

Task Force Members

40 recognized experts across:

5 Utilities
Duke, Xcel, Tri-State, HECO, SCE, SRP

7 System Operators
MISO, ERCOT, NYISO, SPP,
Amprion GmbH, Nat Grid ESO, AEMO

2 Regulators
Texas PUC, Minnesota PUC

3 Reliability Coordinators
NERC, NWPCC, NPCC

3 Developers
Form Energy, Grid United, NextEra,

6 Researchers
NREL, EPRI, University of Edinburgh, Boise State, Cornell University, RMI

Building blocks of resource adequacy

Adequacy assessments and studies

- Forward looking, probabilistic resource adequacy simulations
- What is the collective adequacy of the entire power supply?

Resource Adequacy Metrics

- Quantifies resource adequacy risk
- What is the size, frequency, duration, and timing of system risk?

Capacity Accreditation

- Measures the capacity contributions of individual resources (or classes of resources)
- How do resources compare to one another for their RA benefits?

Resource Adequacy Criteria

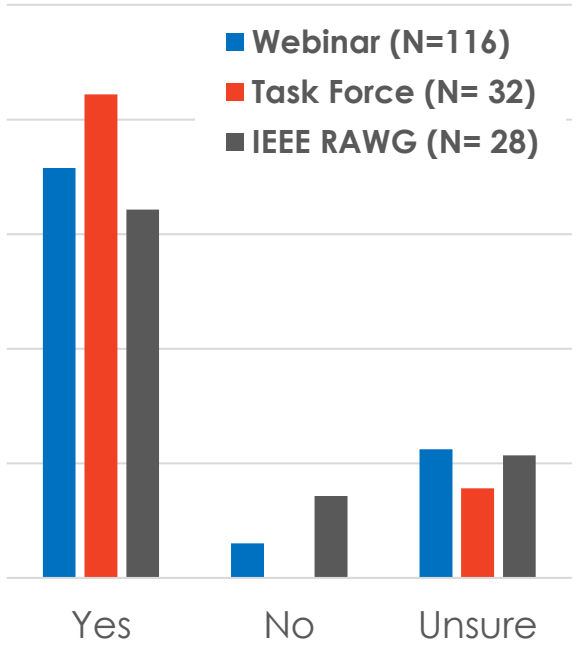
- Sets the threshold for an acceptable level of risk
- How adequate of a system should we have?

Limitations of the current use of LOLE

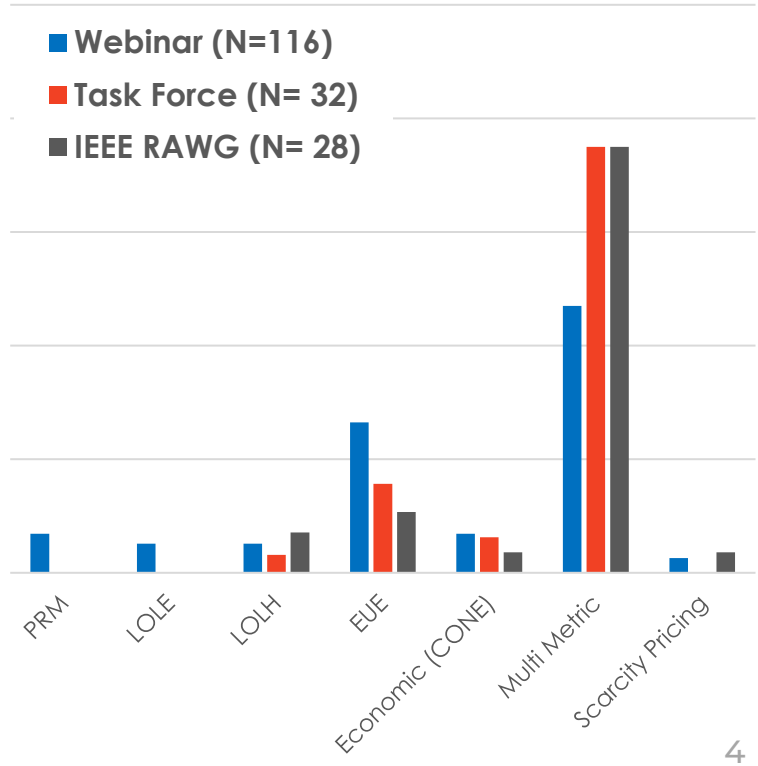
Needs to capture size, frequency, duration, and timing of risk

1. Constitutes a line in the sand, instead of a continuum
2. Inadequate differentiation among the size, frequency, duration, and timing of shortfalls
3. Static criteria are used to represent a dynamic system
4. The risk profile is changing as the resource mix evolves

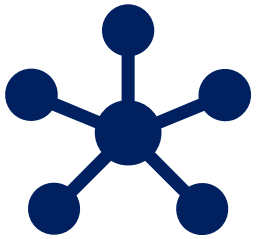
Should the industry consider a new resource adequacy criterion?



If you had to pick one resource adequacy criterion, which would you pick?

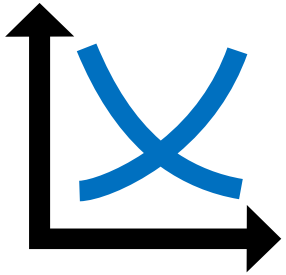


Final Recommendations from the Task Force



1. **Transition to a multi-metric criteria**

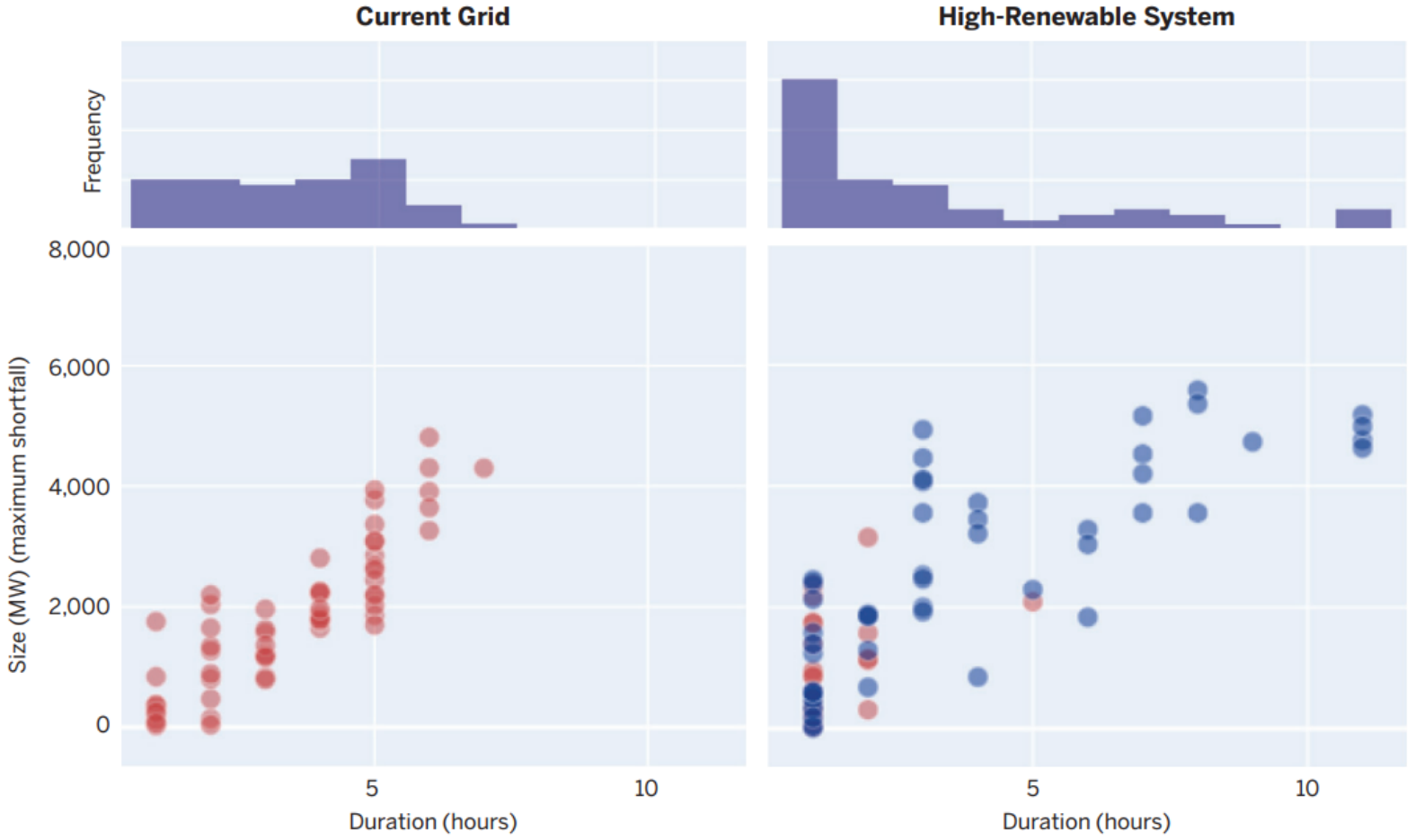
2. **Specifically consider extreme events**



3. **Incorporate economics**

Transition to a multi-metric criteria

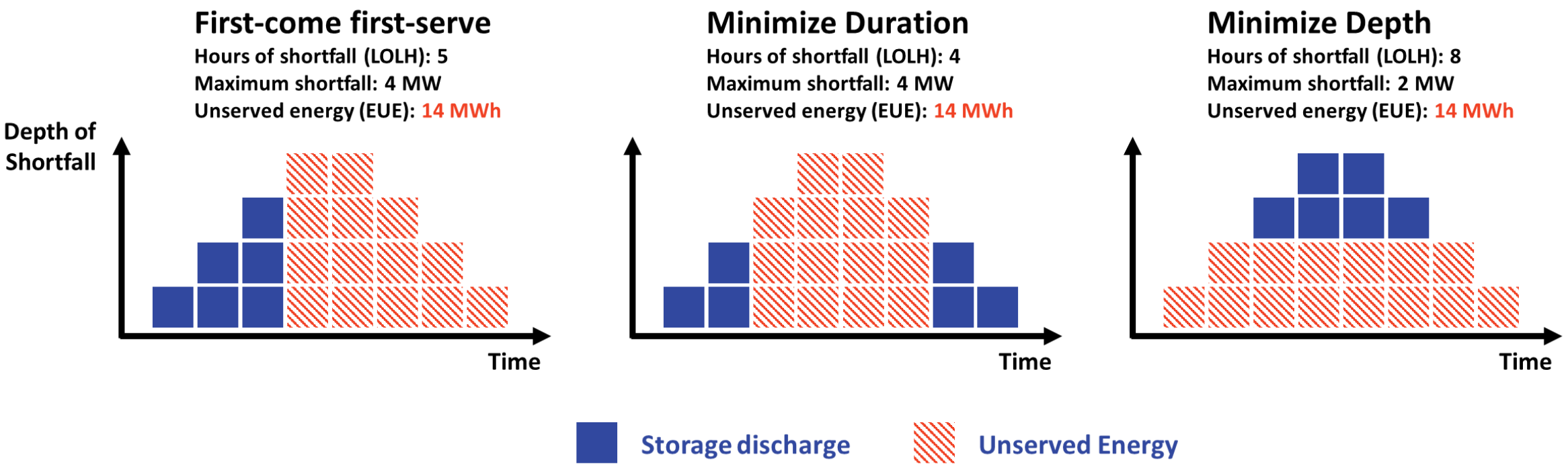
Loss-of-load expectation as the sole resource adequacy criterion only represents a single dimension of risk. It needs to be supplemented



Source: EPRI, Telos Energy

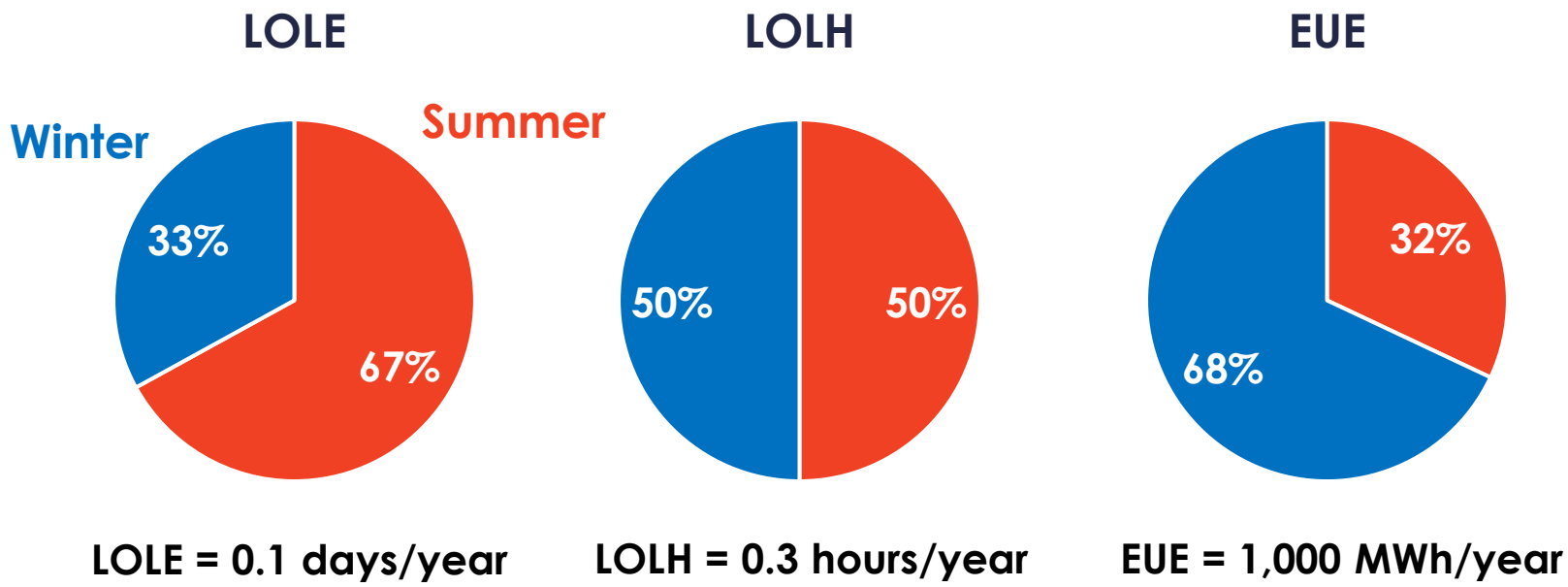
Transition to a multi-metric criteria

Expected unserved energy is a preferred addition to incorporate size of shortfalls, especially as the system moves toward energy limitations



Transition to a multi-metric criteria

No one metric is the solution, and a multi-metric framework is needed to consider size, frequency, duration of shortfalls



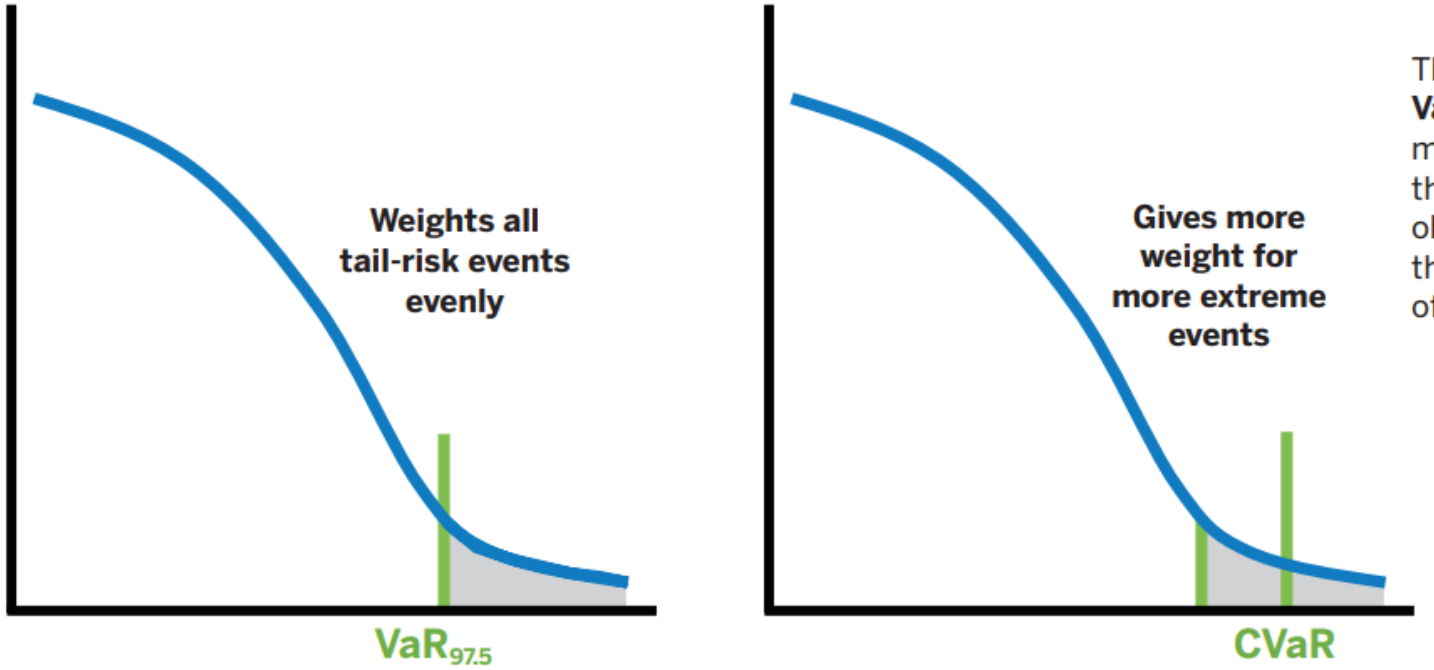
LOLE = 0.1 days/year **LOLH = 0.3 hours/year** **EUE = 1,000 MWh/year**

Source: PJM

Specifically consider extreme events

Not all resource adequacy loss-of-load events are the same. Tail risks can have a disproportionate impact on reliability and costs and should be quantified

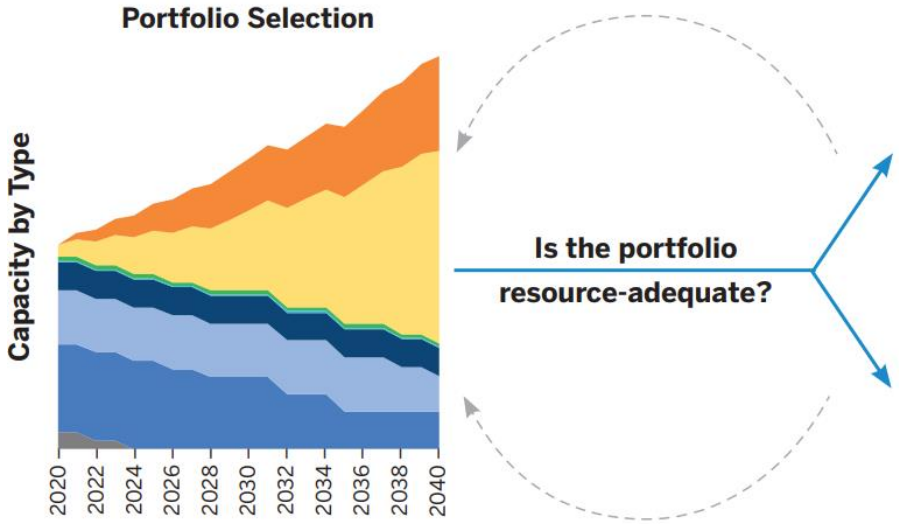
The **Value at Risk (VaR)** metric notes the size or duration of the largest and longest shortfall event for each simulation year (including zero for years with no events) and notes the N^{th} percentile of observations.



The **Conditional Value at Risk (CVaR)** metric calculates the average of the observations above the N^{th} percentile of observations.

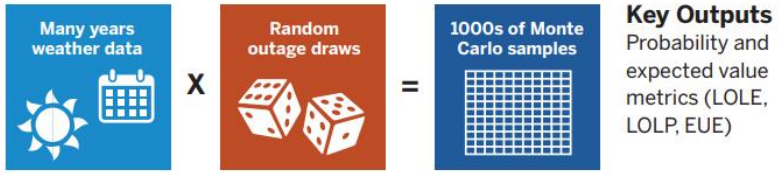
Specifically consider extreme events

Limited data are available to determine with confidence the probability of extreme events. This reality may require discrete analysis or stress-testing



Source: GridLab, Telos Energy

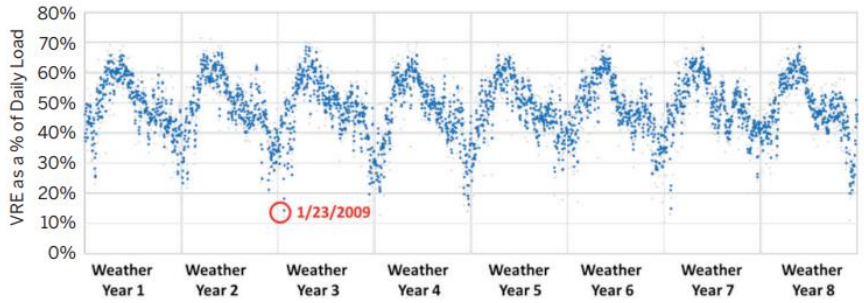
Probabilistic Resource Adequacy Analysis



Key Outputs
Probability and expected value metrics (LOLE, LOLP, EUE)

- Probabilistic assessment of weather and random outage draws
- Simplified model for hundreds or thousands of samples
- Aggregated results for probabilities, but limited specific insights

Stress-Testing Specific Conditions

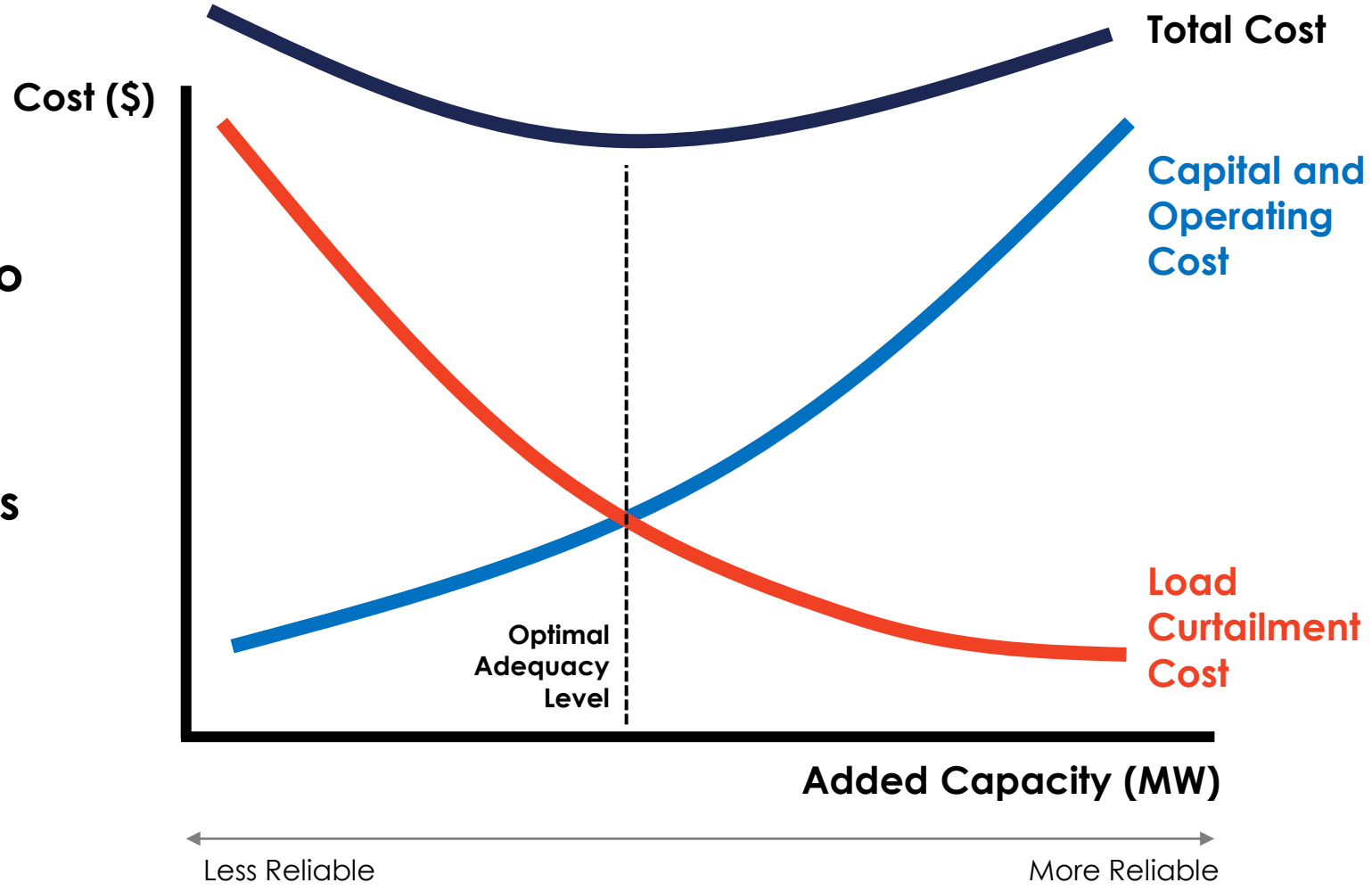


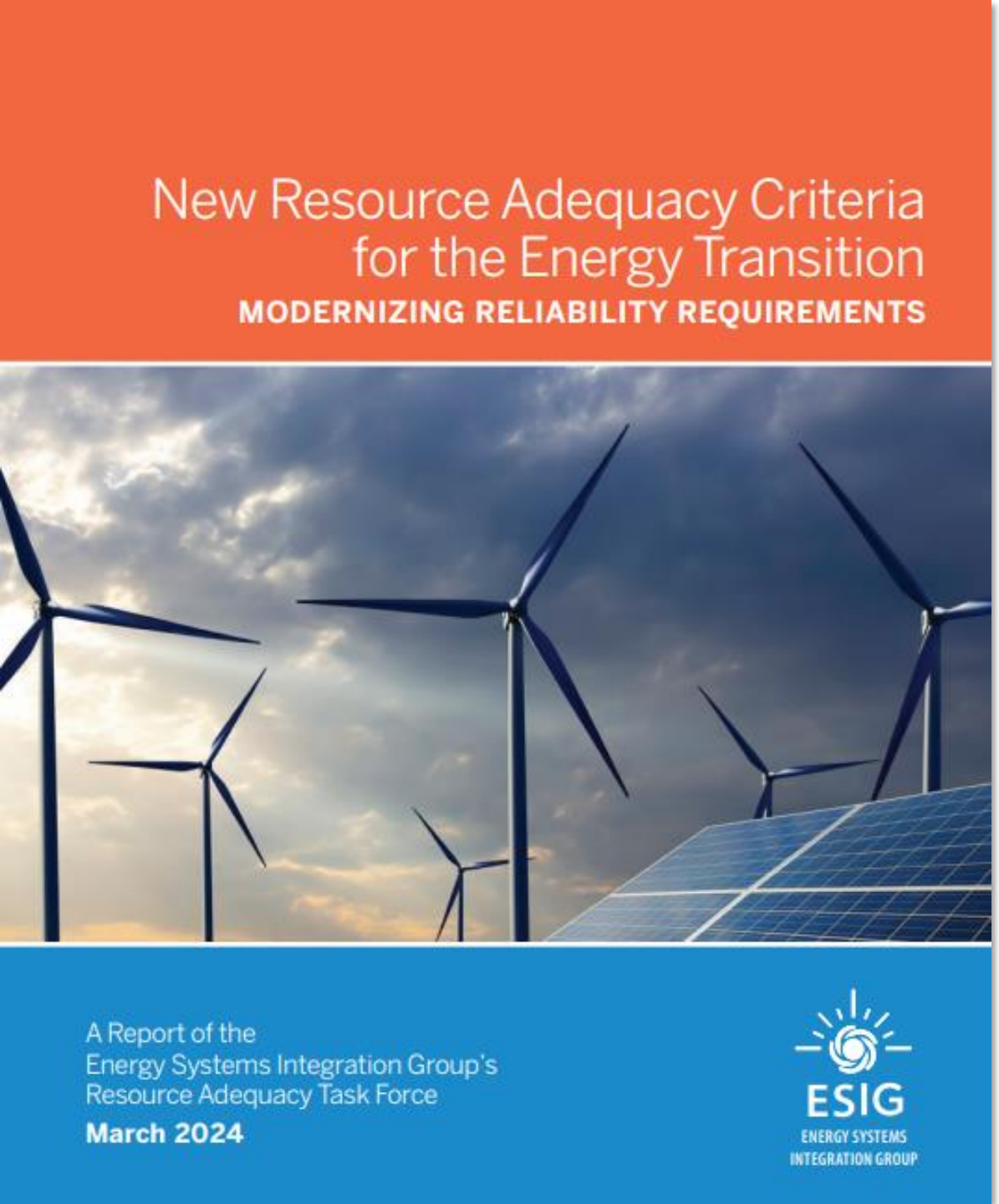
- Detailed stress tests of specific conditions
- Deeper insights into specific weather events
- Additional information in availability of imports and region-wide analysis

Key Outputs
- Unserved energy margin (close calls)
- Reliance on imports
- Key stressors

Incorporate economics

The resource adequacy criterion should be used to establish the appropriate trade-off between reliability and cost, which are intrinsically linked. This should be transparent.





New Report!
https://www.esig.energy/new-resource-adequacy-criteria

THANK YOU

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